

CLAIMS

What is claimed is:

- 1 1. An integrated circuit comprising:
  - 2      circuitry;
  - 3      a bond pad coupled to the circuitry and for interfacing the circuitry with
  - 4      an external circuit; and
  - 5      a special contact pad coupled to the circuitry, the special contact pad for
  - 6      use only when testing the circuitry.
- 1 2. The integrated circuit of claim 1, wherein the special contact pad is smaller
- 2      than the bond pad.
- 1 3. The integrated circuit of claim 1, wherein the special contact pad has a
- 2      maximum dimension of approximately 10 microns.
- 1 4. The integrated circuit of claim 1, wherein the special contact pad is
- 2      structured to receive a spring contact element.
- 1 5. The integrated circuit of claim 1, wherein the special contact pad is for
- 2      communicating test data to the circuitry.
- 1 6. The integrated circuit of claim 1, wherein the special contact pad is for
- 2      communicating data from the circuitry.
- 1 7. The integrated circuit of claim 1, wherein the special contact pad is for
- 2      contacting a circuit node internal to the circuitry.
- 1 8. An integrated circuit comprising:
  - 2      a plurality of circuits;

3           a plurality of bond pads each coupled to at least one of the plurality of  
4   circuits, the plurality of bond pads for interfacing the plurality of circuits with  
5   circuits external to the integrated circuit; and

6           a plurality of special contact pads each coupled to at least one of the  
7   plurality of circuits and providing an electrical contact for communicating  
8   with the plurality of circuits.

1   9. The integrated circuit of claim 8, wherein the bond pads are arranged in a  
2   first predetermined alignment and the special contact pads are arranged in  
3   a second predetermined alignment.

1   10. The integrated circuit of claim 8, wherein the bond pads are disposed along  
2   the periphery of the integrated circuit, and at least one of the special  
3   contact pads is not disposed on the periphery of the integrated circuit.

1   11. The integrated circuit of claim 8, wherein the bond pads are aligned in a  
2   grid pattern on the integrated circuit, and at least one of the special contact  
3   pads is not aligned in the grid pattern.

1   12. The integrated circuit of claim 8, wherein the bond pads are aligned in a  
2   lead-on-center configuration, and at least one of the special contact pads is  
3   not aligned in the lead-on-center configuration.

1   13. The integrated circuit of claim 8, wherein the special contact pads are  
2   smaller than the bond pads.

1   14. The integrated circuit of claim 8, further comprising a spring contact  
2   element attached to one of the special contact pads.

- 1    15. The integrated circuit of claim 8, wherein at least one of the special contact  
2    pad is electrically disposed between two of the plurality of circuits to  
3    monitor signals transmitted between circuits.
- 1    16. The integrated circuit of claim 8, wherein one of the special contact pads  
2    communicates test data to one of the circuits, and another one of the  
3    special contact pads communicates an output of the circuit.
- 1    17. The integrated circuit of claim 8, wherein one of the special contact pads  
2    communicates test data to the one of the circuits, and one of the bond pads  
3    communicates an output of the circuit.
- 1    18. The integrated circuit of claim 8, wherein one of the bond pads  
2    communicates test data to one of the circuits, and one of the special contact  
3    pads communicates an output of the circuit.
- 1    19. The integrated circuit of claim 8, wherein in a first mode of operation one  
2    of the special contact pads communicates data to one of the circuits, and in  
3    a second mode of operation the special contact pads communicates data  
4    from the circuit.
- 1    20. The integrated circuit of claim 8, wherein one of the plurality of circuits is  
2    an embedded memory array, and the special contact pads communicates  
3    address and test data to the embedded memory array.
- 1    21. The integrated circuit of claim 8, wherein one of the plurality of circuits  
2    includes programmable circuitry, and the special contact pads are for  
3    communicating signals for programming the programmable circuitry.
- 1    22. The integrated circuit of claim 8, wherein the bond pads are structured to  
2    be connected to external circuitry by bonding wires, and the special contact

3       pads are not structured to be connected to external circuitry by bonding  
4       wires.

1       23. The integrated circuit of claim 8, wherein the bond pads are structured to  
2       be connected to external circuitry by solder bumps, and the special contact  
3       pads are not structured to be connected to external circuitry by solder  
4       bumps.

1       24. The integrated circuit of claim 8, wherein the bond pads are structured to  
2       be in electrical contact with a package for housing the integrated circuit,  
3       and the special contact pads are not structured to be in electrical contact  
4       with the package.

1       25. The integrated circuit of claim 8, wherein the plurality of circuits includes  
2       a first circuit and a second circuit having a redundant function of the first  
3       circuit, and wherein the special contact pads are disposed about the first  
4       and second circuits to communicate with the first and second circuits.

1       26. The integrated circuit of claim 25, further comprising means for  
2       communicating with the special contact pads and for disabling the first  
3       circuit if it is defective and for enabling the second circuit.

1       27. The integrated circuit of claim 25, further comprising means for  
2       communicating with the special contact pads and for disabling the second  
3       circuit.

1       28. The integrated circuit of claim 8, further comprising electrostatic discharge  
2       protection circuitry for the bond pads and not for the special contact pads.

1       29. An integrated circuit comprising:  
2              a plurality of bond pads;

3           an internal circuit not directly monitorable by the bond pads; and  
4           at least one special contact pad for directly accessing the internal circuit.

1       30. The integrated circuit of claim 29, wherein the internal circuit comprises  
2           an embedded memory array, and the at least one special contact pad  
3           communicates address and memory data with the embedded memory  
4           array.

1       31. The integrated circuit of claim 29, wherein the internal circuit comprises  
2           programmable circuitry, and the at least one special contact pad  
3           communicates programming signals to the programmable circuitry.

1       32. The integrated circuit of claim 29, wherein the bond pads are arranged in a  
2           first predetermined alignment and the at least one special contact pad is in  
3           a second predetermined alignment.

1       33. The integrated circuit of claim 29, wherein the at least one special contact  
2           pad is smaller than the bond pads.

1       34. The integrated circuit of claim 29, further comprising a spring contact  
2           element attached to the at least one special contact pad.

1       35 A package for housing an integrated circuit, comprising:  
2           a plurality of terminals for testing the overall operation of the  
3           integrated circuit; and  
4           a special contact pad for directly accessing an internal circuit of the  
5           integrated circuit.

1       36. The package of claim 35, wherein the special contact pad is for  
2           communicating test signals for the integrated circuit.

- 1    37. The package of claim 35, wherein the special contact pad is for
- 2        communicating test signals from the integrated circuit.
- 1    38. The package of claim 35, wherein the contact pads are aligned in a grid
- 2        pattern on the integrated circuit, and the special contact pads is not aligned
- 3        in the grid pattern.
- 1    39. The package of claim 35, wherein the package comprises a ball-grid-array
- 2        (BGA) package and the contact pads include contact balls.
- 1    40. The package of claim 35, wherein the special contact pad is smaller than
- 2        the contact pad.
- 1    41. The package of claim 35, wherein the special contact pad has a maximum
- 2        dimension of approximately 10 microns.
- 1    42. A method of testing circuitry in an integrated circuit having bond pads
- 2        and a special contact pad, the method comprising:
  - 3           providing test signals to the circuitry; and
  - 4           monitoring an output of the circuitry through the special contact pad.
- 1    43. A method of testing circuitry in an integrated circuit having bond pads
- 2        and a special contact pad, the method comprising:
  - 3           providing test signals to the circuitry through the special contact pad;
  - 4           and
  - 5           monitoring an output of the circuitry through the bond pad.
- 1    44. A method of testing an integrated circuit having bond pads and a special
- 2        contact pad, the method comprising:
  - 3           providing test signals to a first circuit through at least one of the bond
  - 4        pads;

5 monitoring an output of the first circuit through the special contact  
6 pad;  
7 providing the output of the first circuit to a second circuit; and  
8 providing an output of the second circuit to at least another one of the  
9 bond pads.

1 45. A method of testing an integrated circuit on a wafer, comprising:  
2 electrically contacting a first test substrate to special contact pads  
3 disposed on the integrated circuit; and  
4 electrically contacting a second test substrate to bond pads disposed on  
5 the integrated circuit.

1 46. A probe card comprising:  
2 a first probe element for contacting bond pads of an integrated circuit;  
3 and  
4 a second probe element for contacting a special contact pad of the  
5 integrated circuit

1 47. The probe card of claim 46, wherein the first and second probe elements  
2 comprise cantilevered probes.

1 48. The probe card of claim 46, wherein the first and second probe elements  
2 comprise contact balls.

1 49. The probe card of claim 46, further comprising a plurality of the first probe  
2 elements arranged in a first predetermined alignment, and wherein the  
3 second probe element is arranged in a second predetermined alignment.

1 50. The probe card of claim 49, wherein the predetermined alignment is a grid  
2 pattern.

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- 1    51. The probe card of claim 49, wherein the predetermined alignment is a
- 2        rectangular pattern.
- 1    52. The probe card of claim 49, wherein the first and second probe elements
- 2        have different lengths.
- 1    53. The probe card of claim 49, wherein the first and second probe elements
- 2        are spring contact elements.
- 1    54. The probe card of claim 53, wherein the spring contact elements include
- 2        pyramid-shaped tip contact structures.
- 1    55. The probe card of claim 49, wherein the first and second probe
- 2        elements are COBRA-style probes.
- 1    56. An apparatus for communicating signals with an internal circuit node and
- 2        input/output (I/O) node of a semiconductor device, comprising:
  - 3            a first contact element for communicating signals with the internal
  - 4        circuit node; and
  - 5            a second contact element for communicating signals with the I/O node.
- 1    57. The apparatus of claim 56, wherein the first contact element comprises a
- 2        resilient contact element.
- 1    58. The ~~apparatus of~~ claim 57, wherein the second contact element comprises
- 2        a ~~resilient contact~~ element.
- 1    59. The apparatus of claim 56, wherein the first and second contact elements
- 2        have different lengths.
- 1    60. A method of communicating a signal to an internal circuit node of a
- 2        semiconductor device, comprising:

3           contacting a special contact pad that is electrically coupled to the  
4   internal circuit node; and  
5   transferring electrical energy through the special contact pad to the internal  
6   circuit node.

1   61. A socket for releasably connecting a first electronic component to a second  
2   electronic component, comprising:

3        a first plurality of resilient contact structures extending upward from a  
4   top surface of a support substrate, the first plurality of resilient contact  
5   structures for communicating signals with a first plurality of contact points of  
6   the first electronic component;

7        a second plurality of resilient contact structures extending upward from  
8   the top surface of the support substrate, the second plurality of resilient  
9   contact structures for communicating signals with a second plurality of  
10   contact points of the second first electronic component; and

11       a plurality of contact structures disposed on a bottom surface of the  
12   support substrate, selected ones of the contact structures are connected  
13   through the support substrate to selected ones of the resilient contact  
14   structures.

1   62. The socket of claim 61, wherein the second electronic component is a  
2   circuit board.

1   63. The socket of claim 61, further comprising means for receiving the first  
2   electronic component.

1   64. The socket of claim 61, further comprising means for urging the first  
2   electronic component down onto the first and second resilient contact  
3   elements.